

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently amended) A rotation-to-linear motion transforming apparatus comprising:

an eccentric cam coupled to a torque input shaft, said eccentric cam being rotated eccentrically with respect to the torque input shaft;

a cam ring, an inner wall of which is placed in contact ~~of an inner wall thereof~~ with said eccentric cam and ~~to be~~ urged by said eccentric cam to rotate, said cam ring having a flat surface formed on an outer periphery thereof;

a plunger placed to be movable linearly in a direction perpendicular to an axis of rotation of said eccentric cam, said plunger having a flat surface which is pressed against said cam ring in slidable abutment with the flat surface of said cam ring so as to hold said cam ring from ~~rotate~~ rotating and so as to move said plunger linearly; and

a safeguard provided in said cam ring which is responsive to application of a physical load greater than a given degree in a direction of rotation of said eccentric cam to undergo breakage.

2. (Original) A rotation-to-linear motion transforming apparatus as set forth in claim 1, wherein said safeguard is provided in a portion of said cam ring which is out of abutment with said plunger and to which a tensile stress is added when resistance to sliding motion of said cam ring relative to said plunger increases.

3. (Currently amended) A rotation-to-linear motion transforming apparatus as set forth in claim 1, wherein said safeguard is implemented by a groove formed in at least one of ~~an~~ the outer periphery and an inner periphery of said cam ring.

4. (Currently amended) A fuel injection pump for an engine comprising:

a housing having formed therein a cam chamber into which fuel is supplied;
an eccentric cam disposed within the cam chamber of said housing in mechanical connection with a torque input shaft into which torque outputted by an engine is inputted, said eccentric cam being rotated eccentrically with respect to the torque input shaft;

a cam ring, an inner wall of which is placed in contact ~~of an inner wall thereof~~ with said eccentric cam and ~~to be~~ urged by said eccentric cam to rotate, said cam ring having a flat surface formed on an outer periphery thereof;

a plunger placed to be movable linearly in a direction perpendicular to an axis of rotation of said eccentric cam, said plunger having a flat surface which is pressed against said cam ring in slidable abutment with the flat surface of said cam ring so as to hold said cam ring from rotating, thereby urging said plunger to reciprocate to increase and decrease a volume of a fuel pressurizing chamber cyclically; and

a safeguard provided in said cam ring which is responsive to application of a physical load greater than a given degree in a direction of rotation of said eccentric cam to undergo breakage.

5. (Original) A rotation-to-linear motion transforming apparatus as set forth in claim 4, wherein said safeguard is provided in a portion of said cam ring which is out of abutment with said plunger and to which a tensile stress is added when resistance to sliding motion of said cam ring relative to said plunger increases.

6. (Currently amended) A rotation-to-linear motion transforming apparatus as set forth in claim 4, wherein said safeguard is implemented by a groove formed in at least one of ~~an~~ the outer periphery and an inner periphery of said cam ring.

7. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 3, wherein said groove extends from one end to an opposite of the cam ring in an axial direction thereof.

8. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 3, wherein said groove is V-shaped in cross-section.

9 (New) A rotation-to-linear motion transforming apparatus as set forth in claim 3, wherein said groove does not communicate with the inner periphery of the cam ring.

10. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 6, wherein said groove extends from one end to an opposite of the cam ring in an axial direction thereof.

11. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 6, wherein said groove is V-shaped in cross-section.

12. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 6, wherein said groove does not communicate with the inner periphery of the cam ring.

13. (New) A rotation-to-linear motion transforming apparatus comprising:
an eccentric cam coupled to a torque input shaft, said eccentric cam being rotated eccentrically with respect to the torque input shaft;

a cam ring, an inner wall of which is placed in contact with said eccentric cam and urged by said eccentric cam to rotate, said cam ring having opposed flat surfaces formed on an outer periphery thereof;

plungers placed to be movable linearly in a direction perpendicular to an axis of rotation of said eccentric cam, each of said plungers having a flat surface which is pressed against said cam ring in slidable abutment with one of the flat surfaces of said cam ring so as to hold said cam ring from rotating and to move said plungers linearly;
and

a first and a second groove formed in side surfaces of said cam ring which are opposed to each other across said eccentric cam, the first and second grooves tapering in a direction substantially perpendicular to the direction in which said plungers are movable linearly and being offset from each other in the direction in which said plungers are movable linearly, each of the first and second grooves being responsive to application of a physical load greater than a given degree in a direction of rotation of said eccentric cam to undergo breakage.

14. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 13, wherein said grooves extend from one end to an opposite of the cam ring in an axial direction thereof.

15. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 13, wherein each of said first and second grooves is in a V-shaped in cross section.

16. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 13, wherein said grooves do not communicate with the inner periphery of the cam ring.

17. (New) A rotation-to-linear motion transforming apparatus as set forth in claim 13, wherein each of the side surfaces of said cam ring in which said first and second grooves are formed is out of abutment with said plungers and to which a tensile stress is added when resistance to sliding motion of said cam ring relative to said plunger increases.